COLUMBIA RIVER TREATY

AGREEMENT

on

DETAILED OPERATING PLAN

FOR COLUMBIA RIVER TREATY STORAGE

1 JULY 1971 THROUGH 31 JULY 1972

The Principles and Procedures for the Preparation and Use of Hydroelectric Operating Plans for Canadian Treaty Storage, agreed by the Entities on 25 July 1967, provide that the Entities develop a Detailed Operating Plan for each year's actual operation. The Canadian Entity and the United States Entity herewith agree that the Canadian storage will be operated in accordance with the attached "Detailed Operating Plan for Columbia River Treaty Storage -- 1 July 1971 through 31 July 1972," dated 19 August 1971.

Ray G. Williston
Chairman
Canadian Entity

Sept. 30, 1971
(Date signed)

H. R. Richmond
Chairman
United States Entity

9/24/71
(Date signed)

DETAILED OPERATING PLAN

FOR COLUMBIA RIVER TREATY STORAGE

1 JULY 1971 THROUGH 31 JULY 1972

19 AUGUST 1971

19 August 1971

DETAILED OPERATING PLAN FOR COLUMBIA RIVER TREATY STORAGE 1 JULY 1971 THROUGH 31 JULY 1972

1. INTERPRETATION

In this document

(a) "The Principles and Procedures" means the document "Principles and Procedures for the Preparation and Use of Hydroelectric Operating Plans for Canadian Treaty Storage", dated 25 July 1967;

(b) "Assured Operating Plan" means the document "Columbia River Treaty Hydroelectric Operating Plans for Canadian Storage, Operating Years 1969-70 through 1974-75", dated 15 February 1969;

(c) "The Flood Control Plan" means the document "Interim Flood Control Operating Plan for Duncan and Arrow Reservoirs", dated 12 November 1968;

(d) "The Operating Year" means the period from 1 July 1971 through 31 July 1972;

(e) "Operating Committee" means the Columbia River Treaty Operating Committee;

(f) "Detailed Operating Plan" means a detailed operating plan prepared for the Operating Year by the Operating Committee pursuant to the Principles and Procedures and consisting of the contents of this document.

2. PREPARATION AND SCOPE

This Detailed Operating Plan has been developed from the Assured Operating Plan for the Operating Year. System load and resource estimates, duration of critical period, flood control and other criteria

have been reviewed and revised in accordance with Section 16 of the Principles and Procedures and adjusted as necessary. A revised Critical Period System Regulation developed by the Pacific Northwest Coordination Agreement Group was adopted as the Final Critical Period Regulation. The probable effect of initial filling of Libby reservoir scheduled to begin in May 1972 was taken into account.

The data, criteria and procedures presented herein will be used as described for the formulation and use of Operating Rule Curves for each of the Treaty storage reservoirs in Canada, Duncan and Arrow, and for the whole of the Treaty storage in Canada. The operation of Libby during initial filling will be coordinated with the Flood Control operations of other reservoirs.

The usable Treaty storage content available for power purposes during the Operating Year is 8.5 million acre-feet distributed as follows:

Duncan Reservoir

1.411 million acre-feet (711.4 thousand second-foot-days) between elevations 1892.0 feet and 1792.4 feet, measured at Duncan forebay. (Based on B.C. Hydro table dated 24 April 1968.)

Arrow Reservoir

7.089 million acre-feet (3573.4 thousand second-foot-days) between elevations 1444.0 feet and 1377.7 feet, measured at Fauquier, B.C. (Based on data supplied B.C. Hydro by K. A. Henry, C.B.A. Engineering Ltd. dated 11 October 1966.)

The usable Treaty storage available for normal flood control purposes for the Operating Year is 1.27 million acre-feet (640.3 thousand

second-foot-days) in Duncan Reservoir below elevation 1892.0 feet and 7.1 million acre-feet (3579.6 thousand second-foot-days) in Arrow Reservoir below elevation 1444.0 feet, except that additional storage in Arrow Reservoir between elevations 1444.0 feet and 1446.0 feet may also be operated for flood control purposes under special circumstances, as described in the Flood Control Plan.

During the Operating Year, by agreement with B.P.A., B.C. Hydro will provide 2 feet of storage space additional to Treaty storage in Arrow Reservoir and will release water stored in Whatshan Reservoir. Neither of these operations is part of this Detailed Operating Plan and the Operating Committee will ensure that any storages and releases carried out under the B.P.A. - B.C. Hydro agreement will not conflict with any of the provisions of this Detailed Operating Plan.

3. OPERATING RULE CURVE

The Operating Rule Curve for each of the Duncan and Arrow Reservoirs during the period 1 July 1971 through 31 July 1972, to be determined in accordance with the reference documents of Section 1, is defined as follows:

a. During 1 July 1971 through 31 December 1971, it is the higher of the Critical Rule Curve and the Assured Refill Curve, except that under no conditions shall it be higher than the Flood Control Storage Reservation Curve.

b. During 1 January 1972 through 31 July 1972, it is the lower of the Assured Refill Curve and the Variable Refill Curve for Duncan and is the Critical Rule Curve for Arrow. Prior to the operation of Mica there is sufficient inflow at Arrow for both reservoir refill

and water releases to meet downstream power requirements under adverse streamflow conditions. Refill criteria have been incorporated in the Flood Control Plan to assure initiation of refill under a melt sequence such that the flood control refill period is late in commencing.

4. OPERATION

The operation of Canadian Storage by the Columbia River Treaty Operating Committee during the period 1 July 1971 through 31 July 1972 will be in accordance with the reference documents of Section 1, and the following operating guides:

a. Critical Rule Curve and Assured Refill Curve for Duncan, Arrow and the whole of Canadian storage. — Exhibit 1

b. Flood Control Storage Reservation Diagram for Duncan. — Exhibit 2

c. Flood Control Storage Reservation Diagram for Arrow. — Exhibit 3

Notes:

(1) The seasonal volume inflow forecast for the Columbia River at The Dalles supplied by the United States Section of the Operating Committee shall be used to obtain the Flood Control Storage Reservation Curve for Arrow.

(2) The volume inflow forecasting and Variable Refill Curve procedures for Duncan and Arrow shall be as set out in document entitled "Runoff Volume Forecast Program for Canadian Columbia River Treaty Reservoirs" dated 15 August 1969, with subsequent modifications agreed to by the Operating Committee.

(3) For the purpose of this document the Variable Refill Curve for Canadian storage is represented by the Duncan Variable Refill Curve.

5. SCHEDULING STORAGE REGULATION

a. The Operating Committee will exchange all current operating data necessary to the regulation of Canadian Storage projects.

b. Unless otherwise agreed, requests by the U.S. Section of the Operating Committee for the regulation of the Canadian Storage content will be made to the Canadian Section of the Operating Committee on a regular basis in accordance with the following procedures:

(1) Weekly Requests for Storage Regulation During the Storage Drawdown Season.

(a) Timing of Requests. A preliminary request will be made not later than noon each Thursday, followed by a final request by noon Friday if necessary.

(b) Confirmation of Requests. Written confirmation of the request will be dispatched on Friday in accordance with the following format:

"This message will confirm our verbal request of this date for the (storing / drafting) of _____ KSFD (in / from) the whole of Canadian storage for the period (__(date)__) through (__(date)__). This request is based on an estimated average inflow of _____ KCFS to Arrow Lakes and of _____ KCFS to Duncan Lake during the above mentioned period. It is our understanding that during this period the Canadian Entity plans to discharge an average

of _____ KCFS from the Arrow Lakes project and _____ KCFS from the Duncan Project."

(c) Period Covered by Request. The period covered by the request shall be from 0800 hours on the Sunday following the date of the weekly request to 0800 hours on the Sunday a week later.

(d) Release Determinations. The amount of water released or stored during the period of the request will be determined by the changes in reservoir elevation at Duncan and Arrow. The change in Arrow storage content will be determined using the gauge near Fauquier, B.C., for the Lower Arrow Lake and using the gauge near Nakusp, B.C., for the Upper Arrow Lake. The reservoir volume tables which will be used are for Duncan dated 24 April 1968 and for Upper Arrow and Lower Arrow dated April 1968.

(e) Delivery. Requested storage releases will be made effective at the Canadian-United States border. The request will be deemed to have been fulfilled if the total amount of storage water requested is released from Duncan and Arrow reservoirs, provided an amount equal to or greater than the Duncan storage water release is concurrently discharged past Corra Linn Dam. Requests of the U.S. Section of the Operating Committee will recognize that at low elevations discharge of storage from Arrow reservoir may be limited because of channel restrictions between the Upper and Lower Lakes.

(f) Modifications. If any modification to a written request is agreed by the Operating Committee, a further written request superseding the original written request will be dispatched immediately by the U.S. Section of the Operating Committee to the Canadian Section of the Operating Committee.

(g) Non-Routine Operation. Any special operation which is agreed by the Operating Committee will be suitably documented.

(2) Daily Request for Storage Regulation During the Flood Control Season.

(a) Forecasts. Seasonal runoff volume forecasts shall be made available by the Section responsible for the forecast no later than the seventh of each month, as required. Forecasts of seasonal runoff volume at periods other than those representing month-end conditions may be requested by the Operating Committee if hydrologic conditions warrant. Day-to-day streamflow forecasts will be accomplished by use of computer simulation by the Cooperative Columbia River Forecasting Unit. The regulation center required by the Flood Control Plan for the flood regulation will be located in the North Pacific Division Office, Corps of Engineers, in Portland, Oregon.

(b) Daily Requests for Project Outflows. Pursuant to the operating rules in the Flood Control Plan, during the flood control refill period, the release from Canadian storage projects are specified on a day-to-day basis as

project outflows. Requests will be coordinated by telephone daily or on an as-needed basis, by conference calls between members of the Operating Committee or their authorized assistants. Daily requests for project outflows will be documented by message dispatched on the Columbia Basin Teletype Circuit from the regulation center in Portland, Oregon. Best efforts will be made to issue such requests by 1200 hours of each day. The requests will normally prescribe the requested outflows as a mean daily discharge in cubic feet per second, for the 24-hour period from noon-to-noon of each day. Acknowledgement of the teletype request will be made by the Canadian authority by teletype message. The project outflows from Canadian projects will be determined from gaged values by methods as agreed upon for the Hydrometeorological Reporting Network. Any modification of the documented daily request shall be agreed upon by the Operating Committee before being put into effect, and shall be documented by teletype immediately thereafter.

(3) Regulation of Winter Floods. Daily requests for project outflows from Canadian projects are normally confined to the flood control refill period. During periods of high winter flows in the lower Columbia River, where the regulation of Arrow storage would aid in the control of winter floods, the outflows from Arrow will be regulated on a day-to-day basis in accordance with the requests of the U.S. Section of the Operating Committee. The requests for such regulation will be in accordance with procedures described above.

6. OPERATING LIMITS

a. Duncan Project.

(1) Maximum outflow - 20,000 cfs through outlets.

(2) Minimum average weekly outflow - 100 cfs.

(3) Maximum rate of change in outflow - 4,000 cfs per day.

(4) Normal full pool elevation - 1,892 feet.

(5) Minimum pool elevation - 1,792.4 feet.

b. Arrow Project.

(1) Maximum outflow - physical limits only.

(2) Minimum average weekly outflow - 5,000 cfs.

(3) Maximum rate of change in outflow - 25,000 cfs per day.

(4) Normal full pool elevation - 1,444 feet. (The Critical Rule Curve in this Detailed Operating Plan shows storage operation to elevation 1446 feet to reflect the B.P.A. - B.C. Hydro agreement for use of an additional two feet of storage to be operated with no conflict with Treaty Storage.)

(5) Minimum pool elevation - 1,377.7 feet.

(6) Advance notice for changes in outflow for:

(a) Drop in downstream level of:

1/2 foot	None
1 foot	1 hour
2 feet	2 hours
3 feet or more	24 hours

(b) Rise in downstream level of:

1/2 foot	none
1 foot	1 hour
2 feet	2 hours
3 feet	7 hours - only if notice is received early (before 1000 hours) in the day. Otherwise 24-hour notice is required.
More than 3 feet	24 hours

Note: Each 5,000 cfs change causes about one foot variation in the downstream level.

EXHIBIT 1

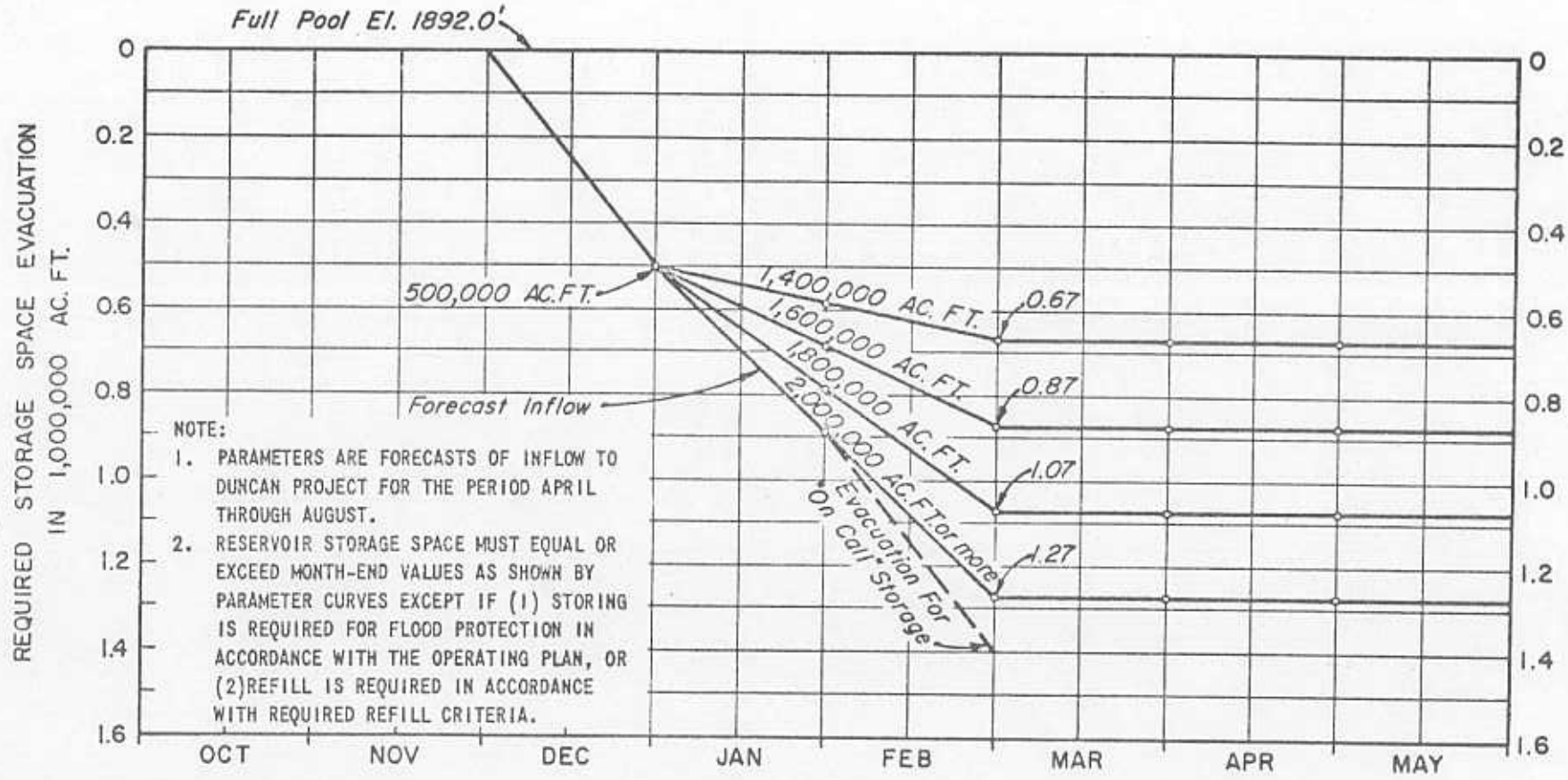
DETAILED OPERATING PLAN FOR COLUMBIA RIVER TREATY STORAGE
CRITICAL RULE CURVE & ASSURED REFILL CURVE
1971-72

End-of-Month Usable Storage Content in 1000 SFD

	Critical Rule Curve			Assured Refill Curve[2]	
Month	Duncan	Arrow[1]	Total	Duncan	Total
July	711.4	3702.4	4413.8	---	---
August	711.4	3702.4	4413.8	---	---
September	601.4	3509.3	4110.7	---	---
October	491.4	3135.3	3626.7	---	---
November	311.4	2397.2	2708.6	---	---
December	161.4	1322.4	1483.8	---	---
January	0	0	0	102.6	102.6
February	0	0	0	108.7	108.7
March	0	0	0	117.8	117.8
April	2.6	0	2.6	134.6	134.6
May	25.9	277.7	303.6	251.8	529.5
June	274.3	2369.3	2643.6	525.7	2895.0
July	533.1	3573.4	4106.5	711.4	4284.8

1/ The 129,000 SFD of storage shown for Arrow in addition to the Treaty amount of 3,573,400 SFD reflects an agreement between B.P.A. and B.C. Hydro for the use of 2 feet of storage space between elevations 1444 and 1446 feet. This agreement provides that such use will in no way conflict with the optimum operation of the Treaty storage.

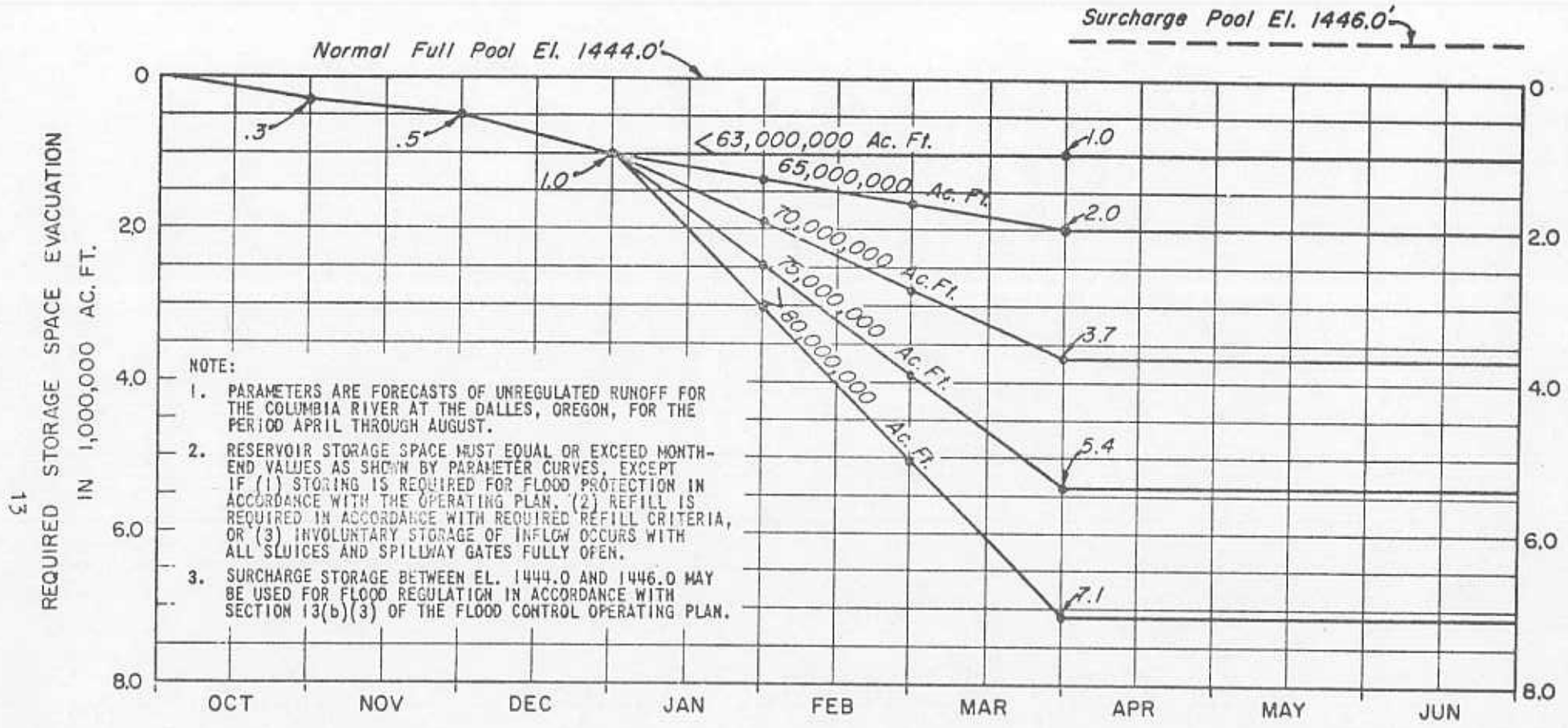
2/ The Critical Rule Curve for Arrow serves as its Assured Refill Curve. Prior to the operation of Mica there is sufficient inflow at Arrow to both refill and meet downstream power requirements under adverse streamflow conditions.



DUNCAN PROJECT
FLOOD CONTROL
STORAGE RESERVATION DIAGRAM

FLOOD CONTROL OPERATING PLAN
COLUMBIA RIVER TREATY
JULY 1968

EXHIBIT 2



ARROW PROJECT
FLOOD CONTROL
STORAGE RESERVATION DIAGRAM
PRE-MICA CONDITIONS

FLOOD CONTROL OPERATING PLAN
COLUMBIA RIVER TREATY
JULY 1968

EXHIBIT 3